NASA/SP—1998–7037/SUPPL386
October 30, 1998

AERONAUTICAL ENGINEERING

A CONTINUING BIBLIOGRAPHY WITH INDEXES

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Typical Report Citation and Abstract

❶ 19970001126 NASA Langley Research Center, Hampton, VA USA
❷ **Water Tunnel Flow Visualization Study Through Poststall of 12 Novel Planform Shapes**
❸ Gatlin, Gregory M., NASA Langley Research Center, USA Neuhart, Dan H., Lockheed Engineering and Sciences Co., USA;
❹ Mar. 1996; 130p; In English
❺ Contract(s)/Grant(s): RTOP 505-68-70-04
❻ Report No(s): NASA-TM-4663; NAS 1.15:4663; L-17418; No Copyright; Avail: CASI; A07, Hardcopy; A02, Microfiche
❼ To determine the flow field characteristics of 12 planform geometries, a flow visualization investigation was conducted in the Langley 16- by 24-Inch Water Tunnel. Concepts studied included flat plate representations of diamond wings, twin bodies, double wings, cutout wing configurations, and serrated forebodies. The off-surface flow patterns were identified by injecting colored dyes from the model surface into the free-stream flow. These dyes generally were injected so that the localized vortical flow patterns were visualized. Photographs were obtained for angles of attack ranging from 10' to 50', and all investigations were conducted at a test section speed of 0.25 ft per sec. Results from the investigation indicate that the formation of strong vortices on highly swept forebodies can improve poststall lift characteristics; however, the asymmetric bursting of these vortices could produce substantial control problems. A wing cutout was found to significantly alter the position of the forebody vortex on the wing by shifting the vortex inboard. Serrated forebodies were found to effectively generate multiple vortices over the configuration. Vortices from 65' swept forebody serrations tended to roll together, while vortices from 40' swept serrations were more effective in generating additional lift caused by their more independent nature.
❽ Author
❾ *Water Tunnel Tests; Flow Visualization; Flow Distribution; Free Flow; Planforms; Wing Profiles; Aerodynamic Configurations*

Key

1. Document ID Number; Corporate Source
2. Title
3. Author(s) and Affiliation(s)
4. Publication Date
5. Contract/Grant Number(s)
6. Report Number(s); Availability and Price Codes
7. Abstract
8. Abstract Author
9. Subject Terms

AERONAUTICAL ENGINEERING

A Continuing Bibliography (Suppl. 386)

OCTOBER 30, 1998

01
AERONAUTICS

19980219349 NASA Langley Research Center, Hampton, VA USA
Aeronautical Engineering: A Continuing Bibliography, Supplement 383
Sep. 18, 1998; 49p; In English
Report No.(s): NASA/SP-1998-7037/SUPPL383; NAS 1.21:7037/SUPPL383; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

This bibliography lists reports, articles and other documents announced in the NASA science and technical information system. Subject coverage includes: Design, construction and testing of aircraft and aircraft engines; aircraft components, equipment and systems; ground support systems; and theoretical and applied aspects of aerodynamics and general fluid dynamics.
CASI
Aerodynamics; Aeronautical Engineering; Bibliographies; Indexes (Documentation)

19980219350 NASA Langley Research Center, Hampton,VA USA
Aeronautical Engineering: A Continuing Bibliography, Supplement 384
Oct. 02, 1998; 38p; In English
Report No.(s): NASA/SP-1998-7037/SUPPL384; NAS 1.21:7037/SUPPL384; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

This bibliography lists reports, articles and other documents announced in the NASA science and technical information system. Subject coverage includes: Design, construction and testing of aircraft and aircraft engines; aircraft components, equipment and systems; ground support systems; and theoretical and applied aspects of aerodynamics and general fluid dynamics.
CASI
Aerodynamics; Aeronautical Engineering; Bibliographies; Indexes (Documentation)

02
AERODYNAMICS

Includes aerodynamics of bodies, combinations, wings, rotors, and control surfaces; and internal flow in ducts and turbomachinery.

19980220443 Ibaraki Univ., Faculty of Engineering, Hitachi, Japan
Performance Comparison Between Two Airfoils for Wind Turbine Blade
Suido, Goichi, Ibaraki Univ., Japan; Kato, Eizi, Ibaraki Univ., Japan; Tachikawa, Tsutomu, Ibaraki Univ., Japan; Matsumiya, Hikaru, Ministry of International Trade and Industry, Japan; Journal of the Faculty of Engineering, Ibaraki University; Dec. 1992; ISSN 0367-7389; Volume 40, pp. 197-204; In Japanese; No Copyright; Avail: Issuing Activity, Hardcopy, Microfiche

The present work is an attempt to examine the characteristics of two airfoils (MEL-IBA-001, FX-84W140) and to discuss the performance for the wind turbine blades. MEL-IBA-001 (MEL) was designed for a wind turbine blade, and FX-84Wl4O (FX) has been used for the blade. The maximums of the camber of MEL and FX and the maximum thickness of both airfoils were situated respectively at 0.47, 0.41, and 0.36 the chord length from the leading edges. Wind tunnel tests for the airfoil characteristics was performed at the Reynolds numbers 0.7 x 10(exp 5) and 3.5 x 10(exp 5), in the range of the angle of attack, -24 deg. to 24

deg. respectively. The results indicate that no appreciable difference was observed in the lift/drag ratio between the airfoils, but MEL was better than FX in the lift characteristics, MEL was therefore preferable to FX for a wind turbine blade.
Author
Wind Tunnel Tests; Wind Turbines; Airfoils; Performance Tests; Turbine Blades; Aerodynamic Characteristics

03
AIR TRANSPORTATION AND SAFETY

Includes passenger and cargo air transport operations; and aircraft accidents.

19980221125 Environmental Protection Agency, Office of Enforcement and Compliance Assurance, Washington, DC USA
Profile of the Air Transportation Industry: EPA Office of Compliance Sector Notebook Project
Feb. 1998; 106p; In English
Report No.(s): PB98-158686; EPA/310/R-97/001; No Copyright; Avail: CASI; A06, Hardcopy; A02, Microfiche

The air transportation sector can be broken down into two categories: (1) facilities providing scheduled, non-scheduled, and air courier services using aircraft, and (2) airports and airport operations. It is these two major topics (i.e., aircraft facilities and airports) and the activities and operations that occur within each of these areas that are the primary focus of this notebook.
NTIS
Air Transportation; Airports; Industries; Pollution Control; Civil Aviation

19980221239 European Organization for the Safety of Air Navigation, Experimental Centre, Bretigny-sur-Orge, France
Comparative Experiments with Speech Recognizers for ATC Simulations
Hering, H., European Organization for the Safety of Air Navigation, France; Mar. 1998; 34p; In English
Report No.(s): PB98-164346; EEC/NOTE-9/98; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Innovative multimedia techniques like speech recognition are in development and could be used for realtime ATC simulation facilities. The specific ATC command language, with its restrictive structure, may be more applicable to speech recognition systems. Industry is offering speech recognition devices based upon different concepts and very high recognition quality is reported. The aim of the experiments reported upon was to examine the recognizers under conditions as closely as possible to real-time ACT simulations. For this reason, speech recordings were conducted during live EEC real-time simulations manned by experimented controllers of different nationalities and diverse native languages.
NTIS
Air Traffic Control; Real Time Operation; Speech Recognition; Command Languages

19980221241 European Organization for the Safety of Air Navigation, Bretigny-sur-Orge, France
Distributed and Fault Tolerant Flight Data Management (DIFODAM)
Florent, J. P., European Organization for the Safety of Air Navigation, France; Barabas, F., European Organization for the Safety of Air Navigation, France; Poddany, A., European Organization for the Safety of Air Navigation, France; Feb. 1998; 34p; In Mixed
Report No.(s): PB98-164379; EEC-326; No Copyright; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

DIFODAM introduces the concept of Shared Flight Plans. Traditional implementations of shared data rely on a central database management system which guarantees data consistency. We propose an alternative solution based on Group Communication which provides a simple, common service for sharing Flight Plan Data in a synchronous multi-server context. We describe the design of the architecture with emphasis on flexibility.
NTIS
Fault Tolerance; Flight Plans; Flight Management Systems; Data Management; Data Base Management Systems; Air Traffic Control; Distributed Processing

19980221251 Federal Aviation Administration, Fire Safety Section, Atlantic City, NJ USA
Initial Development of an Exploding Aerosol Can Simulator
Marker, Timothy, Federal Aviation Administration, USA; Apr. 1998; 20p; In English
Report No.(s): PB98-157977; DOT/FAA/AR-TN97/103; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

A device was constructed to simulate an exploding aerosol can. The device consisted of a cylindrical pressure vessel for storage of flammable propellants and base product and a high-rate discharge (HRD) valve for quick release of the constituents. Simulator tests were conducted using representative constituents and propellant quantities for comparison with actual cans heated to

the point of rupture and ignition. This report describes the tests conducted with the simulator in unconfined spaces, a B-727 cargo compartment, and an LD-3 Unit Loading Device (ULD). Subsequent work is planned with the aim of matching the pressure pulse produced by the exposing aerosol can simulator with that measured during an overheated aerosol can explosion.
NTIS
Aerosols; Simulators; Cans; Explosions

05
AIRCRAFT DESIGN, TESTING AND PERFORMANCE

Includes aircraft simulation technology.

19980220116 NASA Langley Research Center, Hampton, VA USA
An Aerodynamic Assessment of Micro-Drag Generators (MDGs)
Bauer, Steven X. S., NASA Langley Research Center, USA; 1998; 11p; In English; 20th; Applied Aerodynamics, 15-18 Jul. 1998, Albuquerque, NM, USA; Sponsored by American Inst. of Aeronautics and Astronautics, USA
Report No.(s): AIAA Paper 98-2621; Copyright; Avail: Issuing Activity, Hardcopy, Microfiche

Commercial transports as well as fighter aircraft of the future are being designed with very low drag (friction and pressure). Concurrently, commuter airports are being built or envisioned to be built in the centers of metropolitan areas where shorter runways and/or reduced noise footprints on takeoff and landing are required. These requirements and the fact that drag is lower on new vehicles than on older aircraft have resulted in vehicles that require a large amount of braking force (from landing-gear brakes, spoilers, high-lift flaps, thrust reversers, etc.). Micro-drag generators (MDG;s) were envisioned to create a uniformly distributed drag force along a vehicle by forcing the flow to separate on the aft-facing surface of a series of deployable devices, thus, generating drag. The devices are intended to work at any speed and for any type of vehicle (aircraft, ground vehicles, sea-faring vehicles). MDGs were applied to a general aviation wing and a representative fuselage shape and tested in two subsonic wind tunnels. The results showed increases in drag of 2 to 6 times that of a "clean" configuration.
Author
Aerodynamic Drag; Braking; Fighter Aircraft; Flapping; Friction; Landing Gear

19980221238 European Organization for the Safety of Air Navigation, Experimental Centre, Bretigny-sur-Orge, France
Revision Summary Document for the Base Aircraft Data (BADA)
Bos, A., European Organization for the Safety of Air Navigation, France; Mar. 1998; 56p; In English
Report No.(s): PB98-164338; EEC/NOTE-7/98-Rev-3.0; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

This Revision Summary document (RSD) describes all changes made to BADA files in Revision 3.0 since the two previous releases, Revision 2.5 and 2.6. Configuration management procedures for BADA trace all changes through Configuration Change Orders (CCOs). The RSD thus presents a list of all 33 CCOs implemented for BADA 3.0 along with a description for each CCO.
NTIS
Configuration Management; Management Methods; Aircraft Structures; Data Bases

19980221252 European Organization for the Safety of Air Navigation, Experimental Centre, Bretigny-sur-Orge, France
Aircraft Performance Summary Tables for the Base of Aircraft Data (BADA), Revision 3.0, *Jan. 1997 - Mar. 1998*
Bos, A., European Organization for the Safety of Air Navigation, France; Mar. 1998; 92p; In English
Report No.(s): PB98-164395; EEC/NOTE-10/98; No Copyright; Avail: CASI; A05, Hardcopy; A01, Microfiche

A set of aircraft performance summary tables are presented for the 67 aircraft types modeled by the Base of Aircraft Data (BADA) Revision 3.0. For each aircraft type, the performance tables specify the true air speed, rate of climb/descent and fuel flow for conditions of climb, and descent at various flight levels. The performance figures contained within the tables are calculated based on a total-energy model and BADA 3.0 performance coefficients.
NTIS
Aircraft Performance; Aircraft Models; Equivalence; Data Bases; Total Energy Systems

07
AIRCRAFT PROPULSION AND POWER

Includes prime propulsion systems and systems components, e.g., gas turbine engines and compressors; and onboard auxiliary power plants for aircraft.

19980045370 Iowa State Univ. of Science and Technology, Ames, IA USA

Study of a Wake Recovery Mechanism in a High-Speed Axial Compressor Stage *Final Report*

VanZante, Dale E., Iowa State Univ. of Science and Technology, USA; Feb. 1998; 160p; In English

Contract(s)/Grant(s): NAG3-1302; RTOP 523-26-33

Report No.(s): NASA/CR-1998-206594; E-11045; NAS 1.26:206594; No Copyright; Avail: CASI; A08, Hardcopy; A02, Microfiche

This work addresses the significant differences in compressor rotor wake mixing loss which exist in a stage environment relative to a rotor in isolation. The wake decay for a rotor in isolation is due solely to viscous dissipation which is an irreversible process and thus leads to a loss in both total pressure and efficiency. Rotor wake decay in the stage environment is due to both viscous mixing and the inviscid strain imposed on the wake fluid particles by the stator velocity field. This straining process, referred to by Smith (1993) as recovery, is reversible and for a 2D rotor wake leads to an inviscid reduction of the velocity deficit of the wake. A model for the rotor wake decay process is developed and used to quantify the viscous dissipation effects relative to those of inviscid wake stretching. The model is verified using laser anemometer measurements acquired in the wake of a transonic rotor operated in isolation and in a stage configuration at near peak efficiency and near stall operating conditions. Additional insight is provided by a time-accurate 3D Navier-Stokes simulation of the compressor stator flow field at the corresponding stage loading levels. Results from the wake decay model exhibit good agreement with the experimental data. Data from the model, laser anemometer measurements, and numerical simulations indicate that for the rotor/stator spacing used in this work, which is typical of core compressors, rotor wake straining (stretching) is the primary decay process in the stator passage with viscous mixing playing only a minor role. The implications of these results on compressor stage design are discussed.

Author

Turbocompressors; Compressor Rotors; Wakes; Mathematical Models

19980219005 General Electric Co., Aircraft Engines, Cincinnati, OH USA

Optical Closed-Loop Propulsion Control System Development *Final Report*

Poppel, Gary L., General Electric Co., USA; Aug. 1998; 80p; In English; Original contains color illustrations

Contract(s)/Grant(s): NAS3-26617; RTOP 519-30-53

Report No.(s): NASA/CR-1998-208416; E-11272; NAS 1.26:208416; R98AEB237; No Copyright; Avail: CASI; A05, Hardcopy; A01, Microfiche

The overall objective of this program was to design and fabricate the components required for optical closed-loop control of a F404-400 turbofan engine, by building on the experience of the NASA Fiber Optic Control System Integration (FOCSI) program. Evaluating the performance of fiber optic technology at the component and system levels will result in helping to validate its use on aircraft engines. This report includes descriptions of three test plans. The EOI Acceptance Test is designed to demonstrate satisfactory functionality of the EOI, primarily fail-safe throughput of the F404 sensor signals in the normal mode, and validation, switching, and output of the five analog sensor signals as generated from validated optical sensor inputs, in the optical mode. The EOI System Test is designed to demonstrate acceptable F404 ECU functionality as interfaced with the EOI, making use of a production ECU test stand. The Optical Control Engine Test Request describes planned hardware installation, optical signal calibrations, data system coordination, test procedures, and data signal comparisons for an engine test demonstration of the optical closed-loop control.

Author

Optical Measuring Instruments; Control Systems Design; Fabrication; Feedback Control; Acceptability

19980219339 NASA Lewis Research Center, Cleveland, OH USA

Energy Efficient Engine Low Pressure Subsystem Aerodynamic Analysis

Hall, Edward J., Allison Engine Co., USA; Delaney, Robert A., Allison Engine Co., USA; Lynn, Sean R., Allison Engine Co., USA; Veres, Joseph P., NASA Lewis Research Center, USA; Jul. 1998; 18p; In English; 34th; Propulsion, 13-15 Jul. 1998, Cleveland, OH, USA; Sponsored by American Inst. of Aeronautics and Astronautics, USA

Contract(s)/Grant(s): NAS3-27394; RTOP 509-10-11

Report No.(s): NASA/TM-1998-208402; E-11234; NAS 1.15:208402; AIAA Paper 98-3119; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The objective of this study was to demonstrate the capability to analyze the aerodynamic performance of the complete low pressure subsystem (LPS) of the Energy Efficient Engine (EEE). Detailed analyses were performed using three- dimensional Navier-Stokes numerical models employing advanced clustered processor computing platforms. The analysis evaluates the impact of steady aerodynamic interaction effects between the components of the LPS at design and off- design operating conditions. Mechanical coupling is provided by adjusting the rotational speed of common shaft-mounted components until a power balance is achieved. The Navier-Stokes modeling of the complete low pressure subsystem provides critical knowledge of component acro/ mechanical interactions that previously were unknown to the designer until after hardware testing.
Author
Aerodynamic Characteristics; Low Pressure; Mathematical Models

08
AIRCRAFT STABILITY AND CONTROL

Includes aircraft handling qualities; piloting; flight controls; and autopilots.

19980221026 NASA Langley Research Center, Hampton, VA USA
Study of a Simulation Tool to Determine Achievable Control Dynamics and Control Power Requirements with Perfect Tracking
Ostroff, Aaron J., NASA Langley Research Center, USA; Aug. 1998; 30p; In English
Contract(s)/Grant(s): RTOP 522-21-61-01
Report No.(s): NASA/TM-1998-208699; L-17767; NAS 1.15:208699; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

This paper contains a study of two methods for use in a generic nonlinear simulation tool that could be used to determine achievable control dynamics and control power requirements while performing perfect tracking maneuvers over the entire flight envelope. The two methods are NDI (nonlinear dynamic inversion) and the SOFFT(Stochastic Optimal Feedforward and Feedback Technology) feedforward control structure. Equivalent discrete and continuous SOFFT feedforward controllers have been developed. These equivalent forms clearly show that the closed-loop plant model loop is a plant inversion and is the same as the NDI formulation. The main difference is that the NDI formulation has a closed-loop controller structure whereas SOFFT uses an open-loop command model. Continuous, discrete, and hybrid controller structures have been developed and integrated into the formulation. Linear simulation results show that seven different configurations all give essentially the same response, with the NDI hybrid being slightly different. The SOFFT controller gave better tracking performance compared to the NDI controller when a nonlinear saturation element was added. Future plans include evaluation using a nonlinear simulation.
Author
Control Systems Design; Dynamic Control; Feedback Control; Feedforward Control

09
RESEARCH AND SUPPORT FACILITIES (AIR)

Includes airports, hangars and runways; aircraft repair and overhaul facilities; wind tunnels; shock tubes; and aircraft engine test stands.

19980221024 Science Applications International Corp., Air Transportation Systems Operations, Arlington, VA USA
Evaluation of a Heliport Lighting Design during Operation Heli-STAR ***Final Report***
Fontaine, Scott A., Science Applications International Corp., USA; Jun. 1998; 32p; In English
Contract(s)/Grant(s): DTFA01-93-C-00030
Report No.(s): PB98-155401; DOT/FAA/ND-97/20; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The FAA is evaluating the lighting requirements for support of differential GPS approaches to heliports. Previous lighting systems developed by the FAA to support instrument approaches to heliports are the Heliport Instrument Lighting System (HILS) and the Heliport Approach Lighting System (HALS). As a part of the requirements evaluation, a prototype lighting system was developed and tested by the University of Tennessee Space Institute. After a limited evaluation in Tennessee, the FAA conducted further evaluation as part of Operation Heli-STAR, a demonstration helicopter transportation system established in Atlanta, GA during the 1996 Olympic Games. The prototype system used a 20-foot light pipe, green cold-cathode lights, and electrolumines-

cent panels. A semipermanent installation was built, improvements were made, and many parameters were identified for further evaluation in simulation and flight testing. The lighting system has been moved to Washington, DC for further evaluation.
NTIS
Heliports; Flight Tests; Runway Lights; Landing Sites; Illuminating

10
ASTRONAUTICS

Includes astronautics (general); astrodynamics; ground support systems and facilities (space); launch vehicles and space vehicles; space transportation; space communications, spacecraft communications, command and tracking; spacecraft design, testing and performance; spacecraft instrumentation; and spacecraft propulsion and power.

19980219320 NASA Lewis Research Center, Cleveland, OH USA
Performance of the Spacecraft Propulsion Research Facility During Altitude Firing Tests of the Delta 3 Upper Stage
Meyer, Michael L., NASA Lewis Research Center, USA; Dickens, Kevin W., Sierra Lobo, Inc., USA; Skaff, Tony F., Sierra Lobo, Inc., USA; Cmar, Mark D., Sierra Lobo, Inc., USA; VanMeter, Matthew J., Sierra Lobo, Inc., USA; Haberbusch, Mark S., Sierra Lobo, Inc., USA; Jul. 1998; 20p; In English; 34th; Propulsion, 12-15 Jul. 1998, Cleveland, OH, USA; Sponsored by American Inst. of Aeronautics and Astronautics, USA
Contract(s)/Grant(s): RTOP 565-02-0D
Report No.(s): NASA/TM-1998-208477; E-11247; NAS 1.15:208477; AIAA Paper 98-4010; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The Spacecraft Propulsion Research Facility at the NASA Lewis Research Center's Plum Brook Station was reactivated in order to conduct flight simulation ground tests of the Delta 3 cryogenic upper stage. The tests were a cooperative effort between The Boeing Company, Pratt and Whitney, and NASA. They included demonstration of tanking and detanking of liquid hydrogen, liquid oxygen and helium pressurant gas as well as 12 engine firings simulating first, second, and third burns at altitude conditions. A key to the success of these tests was the performance of the primary facility systems and their interfaces with the vehicle. These systems included the structural support of the vehicle, propellant supplies, data acquisition, facility control systems, and the altitude exhaust system. While the facility connections to the vehicle umbilical panel simulated the performance of the launch pad systems, additional purge and electrical connections were also required which were unique to ground testing of the vehicle. The altitude exhaust system permitted an approximate simulation of the boost-phase pressure profile by rapidly pumping the test chamber from 13 psia to 0.5 psia as well as maintaining altitude conditions during extended steady-state firings. The performance of the steam driven ejector exhaust system has been correlated with variations in cooling water temperature during these tests. This correlation and comparisons to limited data available from Centaur tests conducted in the facility from 1969-1971 provided insight into optimizing the operation of the exhaust system for future tests. Overall, the facility proved to be robust and flexible for vehicle space simulation engine firings and enabled all test objectives to be successfully completed within the planned schedule.
Author
Delta Launch Vehicle; Spacecraft Propulsion; Test Firing; Liquid Oxygen; Liquid Hydrogen; Flight Simulation; Rl-10 Engines; Data Acquisition

11
CHEMISTRY AND MATERIALS

Includes chemistry and materials (general); composite materials; inorganic and physical chemistry; metallic materials; nonmetallic materials; propellants and fuels; and materials processing.

19980219328 NASA Lewis Research Center, Cleveland, OH USA
Analysis of Thermal Radiation Effects on Temperatures in Turbine Engine Thermal Barrier Coatings
Siegel, Robert, NASA Lewis Research Center, USA; Spuckler, Charles M., NASA Lewis Research Center, USA; 1997; 10p; In English; Thermal Barrier Coatings, 19-21 May 1997, Fort Mitchell, KY, USA; Meeting sponsored by Thermal Barrier Coatings Interagency Coordinating Committee
Contract(s)/Grant(s): RTOP 523-26-13; No Copyright; Avail: Issuing Activity, Hardcopy, Microfiche

Thermal barrier coatings are important, and in some instances a necessity, for high temperature applications such as combustor liners, and turbine vanes and rotating blades for current and advanced turbine engines. Some of the insulating materials used for coatings, such as zirconia that currently has widespread use, are partially transparent to thermal radiation. The importance of

radiation effects within thermal barrier coatings in a turbine engine was briefly discussed. A translucent coating permits energy to be transported internally by radiation, thereby increasing the total energy transfer and acting like an increase in thermal conductivity. This degrades the insulating ability of the coating. Because of the strong dependence of radiant emission on temperature, internal radiative transfer effects are increased as temperatures are raised. Hence evaluating the significance of internal radiation is of importance as temperatures are increased to obtain higher efficiencies in advanced engines. In a combustor there is radiation from the flame, soot, and hot gases to the combustor liner, first stage turbine vanes, and to some extent to the first stage blades. When a thermal barrier coating is subjected to the combustion environment it will usually become covered with a thin layer of soot. Radiation is then absorbed by the soot, and is partially reradiated into the coating. Coatings in the combustor are considered with both clean and soot covered surfaces; for the turbine the results here are for clean surfaces. Within a hot coating there is internal radiant emission, absorption, and scattering. These mechanisms combine to provide a transport of radiative energy within the coating that acts in combination with heat conduction. Internal radiative effects depend on the properties of the coating materials. If coatings can be made opaque then internal radiation is not a concern, and the only radiative exchange is at the exposed surface of the coating and, for some conditions, at the cooled side of the metal wall. However, some high temperature ceramic materials are somewhat translucent so internal radiation effects can occur, and their importance must be quantitatively evaluated to determine if they are a design consideration. Zirconia is somewhat translucent for radiation in the wavelength range below approximately 5 to 7 microns, and is often approximated as being opaque for wavelengths larger than 5 microns. Zirconia has large scattering compared with absorption. At turbine engine temperatures a considerable portion of blackbody radiant energy is in the translucent wavelength range for zirconia.
Derived from text
Thermal Radiation; Temperature Effects; Turbine Engines; Coating; Barrier Layers

12
ENGINEERING

Includes engineering (general); communications and radar; electronics and electrical engineering; fluid mechanics and heat transfer; instrumentation and photography; lasers and masers; mechanical engineering; quality assurance and reliability; and structural mechanics.

19980219004 Institute for Computer Applications in Science and Engineering, Hampton, VA USA
On the Propagation of Small Perturbations in Two Simple Aeroelastic Systems ***Final Report***
Iollo, Angelo, Politecnico di Torino, Italy; Salas, Manuel D., Institute for Computer Applications in Science and Engineering, USA; Jul. 1998; 12p; In English
Contract(s)/Grant(s): NAS1-19480; NAS1-97046; RTOP 505-90-52-01
Report No.(s): NASA/CR-1998-208457; NAS 1.26:208457; ICASE-98-30; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

In this paper we investigate the wave propagation patterns for two simple flow-structure problems. We focus on the study of the propagation speeds of the waves in the fluid and in the structure, as the rigidity of the structure and the Mach number of the undisturbed flow are changing. Some implications concerning the sound emission by inhomogeneities eventually present in the structure are discussed.
Author
Aeroelasticity; Wave Propagation; Aerodynamic Characteristics; Aerodynamic Forces; Mach Number; Acoustic Emission

19980219309 NASA Lewis Research Center, Cleveland, OH USA
A 3D Euler/Navier-Stokes Aeroelastic Code for Propulsion Applications
Bakhle, Milind A., Toledo Univ., USA; Srivastava, Rakesh, Toledo Univ., USA; Keith, Theo G., Jr., Toledo Univ., USA; Stefko, George L., NASA Lewis Research Center, USA; 1997; 8p; In English; 33rd; Propulsion, 6-9 Jul. 1997, Seattle, WA, USA; Sponsored by American Inst. of Aeronautics and Astronautics, USA
Contract(s)/Grant(s): NAG3-1803; RTOP 538-06-1B; No Copyright; Avail: Issuing Activity, Hardcopy, Microfiche

This paper describes the development and verification of an aeroelastic code (TURBO-AE) based on an Euler / Navier-Stokes unsteady aerodynamic code (TURBO). The aeroelastic formulation is described. The modeling of the dynamics of the blade using a modal approach is detailed, along with the grid deformation approach used to model the elastic deformation of the blade. The work-per-cycle approach used to evaluate aeroelastic stability is described. Representative results for a test configuration used

to verify the code are presented. Results are presented for both zero and non-zero interblade phase angles. The paper concludes with an evaluation of the development thus far, and some plans for further development and validation of the TURBO-AE code.
Author
Three Dimensional Models; Computer Programs; Proving; Navier-Stokes Equation; Aeroelasticity

19980219326 NASA Lewis Research Center, Cleveland, OH USA
The Numerical Propulsion System Simulation: Concept to Product
Lytle, John K., NASA Lewis Research Center, USA; 1997; 7p; In English; Air Breathing Engines, 7-11 Sep. 1997, Chattanoga, TN, USA; Meeting sponsored by International Society for Air Breathing Engines
Contract(s)/Grant(s): RTOP 509-10-11; No Copyright; Avail: Issuing Activity, Hardcopy, Microfiche

The technologies necessary to enable numerical simulations of complete air-breathing gas turbine engines is being developed at the NASA Lewis Research Center in cooperation with industry, academia and other government agencies. Large scale, detailed simulations will be of great value to industry if they eliminate some of the costly testing required to develop and certify engines. In addition, time and cost savings will be achieved by enabling design details to be evaluated early in the development process before a commitment is made to a specific design. This concept has become a project called the Numerical Propulsion System Simulation (NPSS). NPSS consists of three main elements: 1. engineering models that enable multidisciplinary analysis of large subsystems and systems at various levels of detail, 2. a simulation environment that maximizes designer productivity and 3. a cost-effective, high-performance computing platform. A fundamental requirement of the project is that the simulations must be capable of overnight execution on easily accessible computing platforms. The paper will describe the technologies being developed for NPSS and will highlight current capabilities which include 3-D aerodynamic simulations of complex components such as a multistage compressor and of large subsystems such as the low pressure subsystem in a turbofan engine.
Author
Technologies; Propulsion; Numerical Analysis; Gas Turbine Engines; Cost Effectiveness; Air Breathing Engines

19980219354 Research and Technology Organization, Applied Vehicle Technology Panel, Neuilly-sur-Seine, France
Integrated Multidisciplinary Design of High Pressure Multistage Compressor Systems ***La Conception Integree des Compresseurs Multi-Etage a Haute Performance***
Sep. 1998; 156p; In English; Integrated Multidisciplinary Design of High Pressure Multistage Compressor Systems, 14-15 Sep. 1998, Lyon, Cologne, Cleveland, OH, France, Germany, USA; Sponsored by Research and Technology Organization, France; Also announced as 19980219355 through 19980219361; Original contains color illustrations
Report No.(s): RTO-EN-1; AC/323-(AVT)-TP/1; ISBN 92-837-1000-2; Copyright Waived; Avail: CASI; A08, Hardcopy; A02, Microfiche

This Lecture Series covers the recent advances in the process of performing integrated design of high performance multistage compressors. The purpose is to broaden the compressor designer's understanding beyond traditional fluid dynamics to include the multidisciplinary systems approach required by modern gas turbine engines for longer life, lower acquisition and maintenance costs. The design process requires an optimization of the entire machine, which may be significantly different from the best aerodynamic design of each stage or blade row. In addition, many modern engines are simultaneously increasing compressor performance, and reducing machine length, which reinforces the fluid and structure interactions. Finally, in order to reduce both production and maintenance costs, manufacturing constraints have to be taken into account in the initial phase of the design process. The Lecture Series underlines the role of Computational Fluid Dynamics, as well as solid mechanics and vibration simulations. The need for compressor designs to consider and model mechanical interactions and manufacturing concerns will be a central focus. The subjects to be covered are: (1) Flow simulations with special emphasis on three-dimensional computations and on the stage stacking and interactions in multistage compressors; (2) Modelling the fluid structure interactions; and (3) First order manufacturing constraints and requirements.
Author
Multidisciplinary Design Optimization; Gas Turbine Engines; Turbocompressors; Computer Aided Design

19980219355 Ecole Centrale de Lyon, Fluid Mechanics and Acoustic Lab., Ecully, France
Integrated Design of High Pressure Multistage Engines Systemes: An Overview
Leboeuf, Francis, Ecole Centrale de Lyon, France; Integrated Multidisciplinary Design of High Pressure Multistage Compressor Systems; Sep. 1998; 6p; In English; Also announced as 19980219354; Copyright Waived; Avail: CASI; A02, Hardcopy; A02, Microfiche

The gas turbine design associates very different engineering sciences, including aerodynamic, combustion, structure and mechanical systems, and materials. Engines operate close to their limits of mechanical stability, with the help of electronic control

systems. Extensive uses of simulation tools have enabled impressive improvements of performance and reliability. Simultaneously, the designers now put their efforts on the global reduction of costs, such as the development and production costs, the maintenance, repair and disposal costs. The present design approach must include the concept of affordability of technological and financial resources.
Author
Gas Turbine Engines; Turbocompressors; Design to Cost; Multidisciplinary Design Optimization; Engine Design

19980219356 Technische Univ. Munich, Garching, Germany
The Multidisciplinary Design Process
Kau, H.-P., Technische Univ. Munich, Germany; Sep. 1998; 16p; In English; Also announced as 19980219354; Copyright Waived; Avail: CASI; A03, Hardcopy; A02, Microfiche

The complexity of the business process for multistage compressors is similar to that of complete aeroengines or propulsion systems and recent experience can be read across. Special attention is given to the description of the elements of the design process. Based on the necessity for a multidisciplinary approach a design team structure for simultaneous engineering is proposed. Some examples for typical tasks to be solved during the design process illustrate the advantage of an interactive multidisciplinary design and development.
Author
Multidisciplinary Design Optimization; Turbocompressors; Aircraft Engines; Systems Integration

19980219357 Societe Nationale d'Etude et de Construction de Moteurs d'Aviation, Compressor Aerodynamics Dept., Moissy-Cramayel, France
Recent Advances in Compressor Aerodynamic Design and Analysis
Escuret, J. F., Societe Nationale d'Etude et de Construction de Moteurs d'Aviation, France; Nicoud, D., Societe Nationale d'Etude et de Construction de Moteurs d'Aviation, France; Veysseyre, P., Societe Nationale d'Etude et de Construction de Moteurs d'Aviation, France; Sep. 1998; 23p; In English; Also announced as 19980219354; Original contains color illustrations; Copyright Waived; Avail: CASI; A03, Hardcopy; A02, Microfiche

Advances in Computational Fluid Dynamics (CFD) remain a significant source of improvements in the design process of aero-engine fans and compressors, leading to higher performance, cost and design cycle reductions as well as lower associated risks. This paper illustrates the continued integration of CFD tools at SNECMA with a description of the latest developments in compressor aerodynamic design and analysis methods. Three directions of research are currently being pursued. Firstly, the numerical models are constantly improved to take into consideration problems as close as possible to the reality. This means in particular that turbulence models more representative of the real complex flows are introduced. Although it remains very incomplete so far, some unsteady effects are simulated. Also, the description of the compressor geometry is both refined, taking into account various technological effects (i.e. tip clearance; flowpath discontinuity; radius fillets), and extended to the simulation of multiple blade rows. The integration of new CFD tools with improved simulation capabilities requires a permanent update of the design methodology. Secondly, a great effort is currently devoted to adapting the computing environment to the designer needs as it impacts both the quality and the overall duration of the design process. At SNECMA, this approach takes the form of a specifically tailored software environment in order to provide the designer ready to use tools, enabling him to fully exploit the potential of the methods and to focus primarily on the physical analysis of the results. Finally, the most refined CFD tools present only a limited interest to the compressor designer unless they have been extensively validated on significant experimental test cases. This implies that an appropriate validation database representative of real engine flows be acquired. All these aspects of CFD are illustrated in the paper using practical examples supported by both numerical and experimental results. Finally, the prospects of new developments are discussed.
Author
Computational Fluid Dynamics; Turbulence Models; Computerized Simulation; Compressors; Aircraft Engines; Design Analysis; Multidisciplinary Design Optimization

19980219358 General Electric Co., Aircraft Engines, Cincinnati, OH USA
First Order Manufacturing Constraints and Requirements
Bailey, Michael W., General Electric Co., USA; Steinmetz, Gregory T., General Electric Co., USA; Kielb, Robert E., General Electric Co., USA; Long, Loren L., General Electric Co., USA; Herbert, Jeffrey G., General Electric Co., USA; Vishnauski, Jon M., General Electric Co., USA; Sep. 1998; 28p; In English; Also announced as 19980219354; Copyright Waived; Avail: CASI; A03, Hardcopy; A02, Microfiche

The purpose of this section of the lecture series is to discuss first order manufacturing constraints not only in the context of manufacturing, process and producability but their relevance to system considerations of performance, cost and operability. In every design there exists a performance ceiling and a cost floor between which multiple solutions exist. The purpose of a design is to create a product that will provide customer satisfaction in terms of expectations or technical requirements. In the military world this is the ability complete a specific mission and in the commercial world this is the ability to produce a revenue stream. The challenge is to translate these customer Critical to Quality (CTQ) requirements into hardware that will comprise a system. Consequently an understanding of the flowdown of the customer CTQ's to individual parts is essential if customer satisfaction is to be achieved. This represents the challenge in GEAE's Design For Six Sigma (DFSS) initiative and is driving the shift from deterministic to probabilistic design methodologies.
Author
Manufacturing; Structural Analysis; Structural Design; Structural Design Criteria; Aerodynamics; Compressors

19980219359 Technische Univ. Munich, Garching, Germany
Compressor Matching and Designing for Tip Clearance
Kau, H.-P., Technische Univ. Munich, Germany; Sep. 1998; 18p; In English; Also announced as 19980219354; Copyright Waived; Avail: CASI; A03, Hardcopy; A02, Microfiche

Compressors are designed for a specific duty reflected in the thermodynamic performance target, for design goals and for overall items in the specification, e.g. geometric dimensions, weight and cost. Early in the design phase general decisions need to be taken which, based on the technology level of the designing company decide on the degree of challenge and thus the risk of the whole project. For best performance, the most important early decision is the level of stage loading and its distribution throughout the compressor. Together with the definition of the available cross section in each axial position, this determines the stagewise matching. This lecture firstly describes the general rules of matching multistage compressors and secondly, from a design point of view, discusses one of the most important parameters influencing the matching during steady operation but even more significantly during transient operation, the design of tip clearance.
Author
Turbocompressors; Clearances; Tolerances (Mechanics); Blade Tips; Multidisciplinary Design Optimization; Computer Aided Design

19980219360 General Electric Co., Aircraft Engines, Cincinnati, OH USA
First Order Manufacturing Constraints and Requirements: Design to Cost and Manufacturing Process Considerations
Long, Loren L., General Electric Co., USA; Bailey, Michael W., General Electric Co., USA; Herbert, Jeffrey G., General Electric Co., USA; Sep. 1998; 28p; In English; Also announced as 19980219354; Copyright Waived; Avail: CASI; A03, Hardcopy; A02, Microfiche

In this session of the lecture series we will discuss the impact of cost as a design parameter. Historically in aircraft engine design up until the beginning of 1990, technology drove the design and cost was merely a resultant. With the end of the Cold War and the unprecedented airline losses in the early 1990's, cost shifted from being merely a resultant to a design parameter comparable with weight, specific fuel consumption and thrust. If we define Manufacturing Cost + Contribution Margin = Sell Price and Contribution Margin - Fixed Cost = Operating Margin, downward pressure on price from the customer and the need to maintain operating margin for the shareholders leaves manufacturing and fixed costs as the only variables. The effects of this were felt, not only in the manufacturing area, but also in engineering with the resulting trend to move to more technologically conservative robust designs.
Derived from text
Design to Cost; Engine Design; Aircraft Engines; Design Analysis; Cost Analysis; Manufacturing; Concurrent Engineering

19980219361 General Electric Co., Aircraft Engines, Cincinnati, OH USA
First Order Manufacturing Constraints and Requirements: Common Geometry and Multidisciplinary Design and Optimization
Bailey, Michael W., General Electric Co., USA; Vishnauski, Jon M., General Electric Co., USA; Sep. 1998; 28p; In English; Also announced as 19980219354; Copyright Waived; Avail: CASI; A03, Hardcopy; A02, Microfiche

In this session we will discuss future developments. A key area is the concept of common geometry or master model. There are many definitions of a Master Model. At GEAE the definition is a single geometric representation, ideally 3-D, created at concept using feature based parametric modeling techniques in a linked associative environment. In addition there would be a tight integration of all elements of a product creation, manufacturing and support permitting true concurrency for analysis and manufacturing since updates can be flowed down to the individual activities from the Master Model. An additional requirement is the man-

agement of all types of data or metadata within the common geometry environment. Historically, analysis codes were coupled together with input and output files with geometry provided as an output as necessary, probably in the form of an IGES file. The new approach is to have geometry central or common to all the processes and use geometry as a design integrator. This would facilitate CAD integration with analysis and CAD integration with manufacturing.
Author
Multidisciplinary Design Optimization; Computer Aided Design; Descriptive Geometry; Design Analysis; Computer Aided Manufacturing; Three Dimensional Models; Aircraft Engines

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GEOSCIENCES

Includes geosciences (general); earth resources and remote sensing; energy production and conversion; environment pollution; geophysics; meteorology and climatology; and oceanography.

19980221022 ENSR Corp., Acton, MA USA
Results of the Independent Evaluation of ISCST3 and ISC-PRIME ***Final Report***
Paine, R. J., ENSR Corp., USA; Lew, F., ENSR Corp., USA; Nov. 1997; 844p; In English
Report No.(s): PB98-156524; Copyright Waived; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

Aerodynamic building downwash is an important part of air quality dispersion modeling. The Electric Power Research Institute (EPRI) initiated a development program to address deficiencies in the downwash algorithms in the Industrial Source Complex (ISCST3) air dispersion model. The result of the project is a set of algorithms called PRIME (Plume Rise Model Enhancements) which were added to ISCST3. The new model was called ISC-PRIME. As part of the project, EPRI contracted with ENSR to prepare an independent evaluation of ISC-PRIME using a model evaluation protocol negotiated with the US EPA. This report describes the databases used in the evaluation and the results of the model performance evaluation.
NTIS
Downwash; Algorithms; Environment Models; Data Bases; Evaluation

19980221023 ENSR Corp., Acton, MA USA
Consequence Analysis for ISC-Prime ***Final Report***
Paine, Robert J., ENSR Corp., USA; Lew, Frances, ENSR Corp., USA; Nov. 1997; 318p; In English
Report No.(s): PB98-156516; Copyright Waived; Avail: CASI; A14, Hardcopy; A03, Microfiche

Aerodynamic building downwash is a phenomenon caused by eddies created by air movement around building obstacles. Through the use of the Industrial Source Complex (ISCST3) model, EPA modeling guidelines have incorporated these effects in ground-level concentration calculations. In 1992, the Electric Power Research Institute (EPRI) decided to embark upon a program (project PRIME: Plume Rise Model Enhancements) to design a new downwash model to correct the deficiencies in the ISCST3 model. The resulting downwash module, PRIME, has been installed in the ISCST3 model as a replacement for the current algorithm; the resulting model is referred to as 'ISC-PRIME'. This report describes the design of the model test runs involved and provides a summary of the results with comments on the differences between the two models.
NTIS
Plumes; Downwash; Air Pollution

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LIFE SCIENCES

Includes life sciences (general); aerospace medicine; behavioral sciences; man/system technology and life support; and space biology.

19980219171 Civil Aeromedical Inst., Oklahoma City, OK USA
DNA Profiling as an Adjunct Quality Control/Quality Assurance in Forensic Toxicology ***Final Report***
Chaturvedi, Arvind K., Civil Aeromedical Inst., USA; Vu, Nicole T., Civil Aeromedical Inst., USA; Ritter, Roxane M., Civil Aeromedical Inst., USA; Canfield, Dennis V., Civil Aeromedical Inst., USA; Jul. 1998; 10p; In English
Contract(s)/Grant(s): FAA-AM-B-97-TOX-202
Report No.(s): DOT/FAA/AM-98/18; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

To investigate aircraft accidents, multiple postmortem biological samples of victims are submitted to the Civil Aeromedical Institute for toxicological evaluation. However, depending upon the nature of a particular accident, body components are often scattered, disintegrated, commingled, contaminated, and/or putrefied. These factors impose difficulties on victim identification, tissue matching, and thereby authentic sample analysis and result interpretation. Nevertheless, these Quality Control/Quality Assurance (QC/QA) related limitations can be overpowered by DNA profiling. In this regard, three situations are hereby exemplified where DNA analysis was instrumental in resolving a tissue mismatching/commingling issue, pinpointing an accessioning/analytical error, and interpreting an unusual analytical result. Biological samples from these cases were examined for six independently inherited genetic loci using Polymerase Chain Reaction (PCR) suitable for analyzing degraded DNA generally encountered in putrefied/contaminated samples. In the first situation, three of five specimen bags from one accident were labeled with two different names. DNA analysis revealed that one of these bags actually had commingled specimens, originating from two different individuals. Therefore, the sample was excluded from the final toxicological evaluation. In the second situation, an unacceptable blind control result was reported in a cyanide batch analysis. by comparing DNA profiles of the batch samples with those of the known positive and negative blind controls, it was concluded that the error had occurred during the analysis instead of accessioning. Accordingly, preventive measures were taken at the analytical level. The third situation was related to the presence of atropine at toxic concentrations in the blood (318 ng/mi) and lung (727 ng/g) with its absence in the liver, spleen, and brain-a pattern inconsistent with the general poisoning of drugs. DNA analysis of the blood and liver samples exhibited their common identity, ensuring that the submitted samples had indeed originated from one individual. The selective presence of atropine was attributed to its possible administration into the thoracic cavity by the emergency medical personnel at the accident site for resuscitation, but circulatory failure prevented its further distribution. These examples clearly demonstrate the applicability of the PCR-based DNA profiling in a QC/QA program to enhance the effectiveness of forensic toxicology operation. However, such applicability will be feasible only in those setups where in-house DNA facilities are accessible.
Author
Deoxyribonucleic Acid; Toxicology; Aircraft Accidents; Identities; Cyanides

18
SPACE SCIENCES

Includes space sciences (general); astronomy; astrophysics; lunar and planetary exploration; solar physics; and space radiation.

19980219170 NASA Langley Research Center, Hampton, VA USA
Numerical Roll Reversal Predictor-Corrector Aerocapture and Precision Landing Guidance Algorithms for the Mars Surveyor Program 2001 Missions
Powell, Richard W., NASA Langley Research Center, USA; 1998; 11p; In English; Atmospheric Flight Mechanics Conference, 10-12 Aug. 1998, Boston, MA, USA; Sponsored by American Inst. of Aeronautics and Astronautics, USA
Report No.(s): AIAA Paper 98-4574; No Copyright; Avail: Issuing Activity (American Inst. of Aeroanutics and Astronautics, 1801 Alexander Bell Dr., Suite 500, Reston, VA), Hardcopy, Microfiche

This paper describes the development and evaluation of a numerical roll reversal predictor-corrector guidance algorithm for the atmospheric flight portion of the Mars Surveyor Program 2001 Orbiter and Lander missions. The Lander mission utilizes direct entry and has a demanding requirement to deploy its parachute within 10 km of the target deployment point. The Orbiter mission utilizes aerocapture to achieve a precise captured orbit with a single atmospheric pass. Detailed descriptions of these predictor-corrector algorithms are given. Also, results of three and six degree-of-freedom Monte Carlo simulations which include navigation, aerodynamics, mass properties and atmospheric density uncertainties are presented.
Author
Algorithms; Predictor-Corrector Methods; Numerical Analysis; Deployment; Aircraft Landing; Aerocapture

19980219469 NASA Langley Research Center, Hampton, VA USA
An Atmospheric Guidance Algorithm Testbed for the Mars Surveyor Program 2001 Orbiter and Lander
Striepe, Scott A., NASA Langley Research Center, USA; Queen, Eric M., NASA Langley Research Center, USA; Powell, Richard W., NASA Langley Research Center, USA; Braun, Robert D., NASA Langley Research Center, USA; Cheatwood, F. McNeil, NASA Langley Research Center, USA; Aguirre, John T., NYMA, Inc., USA; Sachi, Laura A., Lockheed Martin Corp., USA; Lyons, Daniel T., Jet Propulsion Lab., California Inst. of Tech., USA; 1998; 13p; In English; Atmospheric Flight Mechanics Conference, 10-12 Aug. 1998, Boston, MA, USA; Sponsored by American Inst. of Aeronautics and Astronautics, USA
Report No.(s): AIAA Paper 98-4569; No Copyright; Avail: Issuing Activity (American Inst. of Aeronautics and Astronautics, 1801 Alexander Bell Dr., Suite 500, Reston, VA), Hardcopy, Microfiche

An Atmospheric Flight Team was formed by the Mars Surveyor Program '01 mission office to develop aerocapture and precision landing testbed simulations and candidate guidance algorithms. Three- and six-degree of-freedom Mars atmospheric flight simulations have been developed for testing, evaluation, and analysis of candidate guidance algorithms for the Mars Surveyor Program 2001 Orbiter and Lander. These simulations are built around the Program to Optimize Simulated Trajectories. Subroutines were supplied by Atmospheric Flight Team members for modeling the Mars atmosphere, spacecraft control system, aeroshell aerodynamic characteristics, and other Mars 2001 mission specific models. This paper describes these models and their perturbations applied during Monte Carlo analyses to develop, test, and characterize candidate guidance algorithms.
Author
Spacecraft Control; Flight Simulation; Controlled Atmospheres; Algorithms; Aerocapture; Landing Instruments

Subject Term Index

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Personal Author Index

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